



EFFICACY OF IVERMECTIN ON TROPICAL MITE (ORNITHONYSSUS BACOTI) IN NATURALLY INFECTED LABORATORY MICE

Shivan N. Hussein¹, Ihsan K. Zangana² and Shakhawan latif³

¹Department of Medicine and Surgery, College of Veterinary Medicine, Duhok University

²Department of Animal Production, College of Agriculture, Duhok University

³Department of Clinical Signs, College of Veterinary Medicine, University of Sulaymania

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ABSTRACT

Eighty white Swiss mice were kept in laboratory of Faculty of Veterinary medicine, Duhok University, North of Iraq, for experimental using as routine animals models. In March, 2014, accidentally all mice were found a highly infested with irritant tropical rat mite *Ornithonyssus bacoti*. The final diagnosis of this mite was based on the morphological features. The infested mites were suffered from signs of irritation and suppurative pruritic dermatitis. By histological examination revealed different histological changes including; Hyperkeratosis, thickness in deep dermal layers and heavy leukocytes infiltration. The mites were completely removed from infested mice and skin lesion disappeared after a single subcutaneous ingestion with ivermectin.

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INTRODUCTION

The mesostigmated mites are large order of highly motile mites, class Arachnida, subclass Acari, order Mesostigmata. The two mites reported in laboratory rodent colonies, *Ornithonyssus bacoti* and *Laelaps echidnina* (1).

The tropical rat mite *O. bacoti* is an obligates blood sucking parasite with worldwide distribution. Natural hosts of bacoti include several species of rats and mice, hamsters, gerbils, voles and other wild rodents (2). The tropical mite is between 0.75mm and 1.44 mm in length and is non-segmented with chelicerae or mandible which are suited to piercing (3,4). They have a sharp caudal apex of the scutum, an oval genital shield and a cranially positioned anus (2). These mites are capable of parthenogenic reproduction (5). After taking a blood meal, they are static and yellow or black red in color. However more active and grey in color (4). *O. bacoti* mite has a rapid life cycle of 7 to 16 days from egg to egg production for each generation. It's also very prolife with a single female laying as 140 eggs during its 60 days life time (6, 7). In laboratory mice, serve *O. bacoti* infestation has been associated with decreased litter production (8), anemia and death (9). The control of *O. bacoti* is somewhat difficult due to the nature of this parasite, which is more likely to be found in the litter or in corners or racks of living areas, than on the hosts skin itself (10).

Many insecticides were considered to eliminate the mites. Insecticides that interrupt neurotransmission in insects such Pyrethrin, Pyrethroids and Ivermectin, which have been used for many years as well as more recent products (11). Due to its wide margin of safety, ease of administration and mechanism of action is a popular anthelmintic for use in laboratory and domestic animals and human (12). During accidental outbreak of mite infestation in colonies of mice in our laboratory. Faculty of veterinary medicine/ Duhok University.

This study was planned to known the causative agent and simple trials to control and elimination of the tropical mite (*Ornithonyssus Bacoti*) by using Ivermectin as one of an effective anthelmintic.

MATERIALS AND METHODS

Eighty White Swiss (albino mice) were brought from laboratory animals of faculty of veterinary medicine to our laboratory of clinical pathology. The mice kept in special cages. About of 10 in each cage, in order of several routine purposed. These cages were provided with optimal ambient temperate 23-27 C° and normal rat food and clean water supply.

On March 2014, through routine examination of colonies, we observed unusual irritation signs appeared on all mice, and some with severe cutaneous lesions, and six mice were found dead and also through a close inspection of colonies, there

*Corresponding author: Shivan N. Hussein

Department of Medicine and Surgery, College of Veterinary Medicine, Duhok University

were found actively moving of the ectoparasites on different sites of cages, between foot and on entire body of mice. The samples of ectoparasites were collected in 90% ethanol and examined under dissecting microscope and light microscope.

The skin specimen from cutaneous lesion was fixed in 10% neutral buffered formalin. Tissue samples were embedded in paraffin and thin sectioned 5 micron thicknesses, and then the section was stained with hematoxylin and eosin.

Four groups of heavily infested mice with the parasite (each contained 10 mice) were used for evaluation of Ivermectin. The doses of 0.1mcg/kg, 0.2mcg/kg of drug Ivermectin (Uvema/uvved 1%) were injected subcutaneously s/c in the group 1, 2, 3 respectively and group 4 remained without treatment as control group. After treatment all mice were kept in clean cages.

RESULTS

On closely examination of mice in all cages. The all mice were observed with signs of irritation. Also six infested mice 7.4% were found dead, and some infested mice were showed varies gross lesions on the skin, these include, severe suppurative pruritic dermatitis to mild spotted erythemic papules on the different site of the body (Fig.1).

All collected samples of the parasite were examined by dissecting microscope and light microscope which revealed both; unfed, grey color mites and heavily engorged red to black red female mites were infested and free life in the cages (Fig.2). In depending on morphological feature of mites, that all collected mites belonged to the species of *O. bacoti*.

Histopathological sections were revealed a mild to a severe inflammatory change in the epidermal and deep dermal layers of skin. The epidermal layer showed many changes, these include hyperkeratosis of the skin due to hyperplasia of the stratum corneum and granulosum, these causing thicknesses of the epidermis. There was also skin parakeratosis due to excoriation of the epidermis (Fig.3). There was evidence of invasion of mouth part of mite into epidermal layer of the skin and present of mites on superficial site of the skin (fig. 3, arrow). The deep dermal layer was showed thickness and heavy infiltration of mononuclear and eosinophilic granulocytes leukocytes. There was also alopecia and destruction of many hair follicles (Fig.4). The result of effect of Ivermectin showed in Table (1). The all mice 100% in a group three which received 300 mcg of Ivermectin were showed signs of neurotoxicity of Ivermectin, these include short duration of severe tremor, comma sleeping and death. The two other groups were found a completely relieved from infested mites from second day after treatment till the end of the study. The skin lesions were appeared a gradually repaired, start from 4th day after treatment. The hair showed reappeared and completely developed at the end of the study (20 days), absence of irritation signs and purities and the all mice were appeared actively inbeavering.

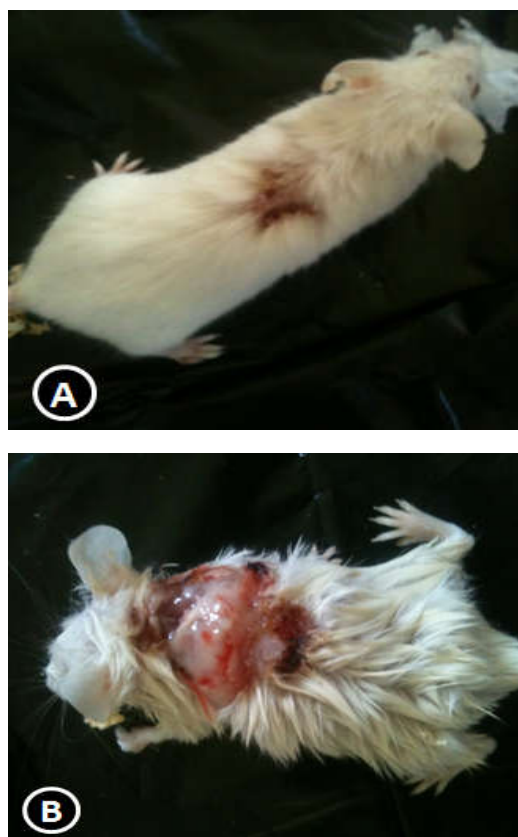


Figure 1 A. erythemic papule. B. suppurative pruritic dermatitis



Figure 2 A. Un fed mite. B. Fed engorged female. of *O. Bacoti*.

Table 1 Efficacy of Ivermectin in treated groups of mice against *O. bacoti*.

Group	No. of Mice	Dose (Mcg)	2nd Day after treatment	4th Day after treatment	6th Day after treatment	10th Day after treatment
1	10	100	-	-	-	-
2	10	200	-	-	-	-
3	10	300	Dead	-	-	-
4	10	Control	+	-	-	-

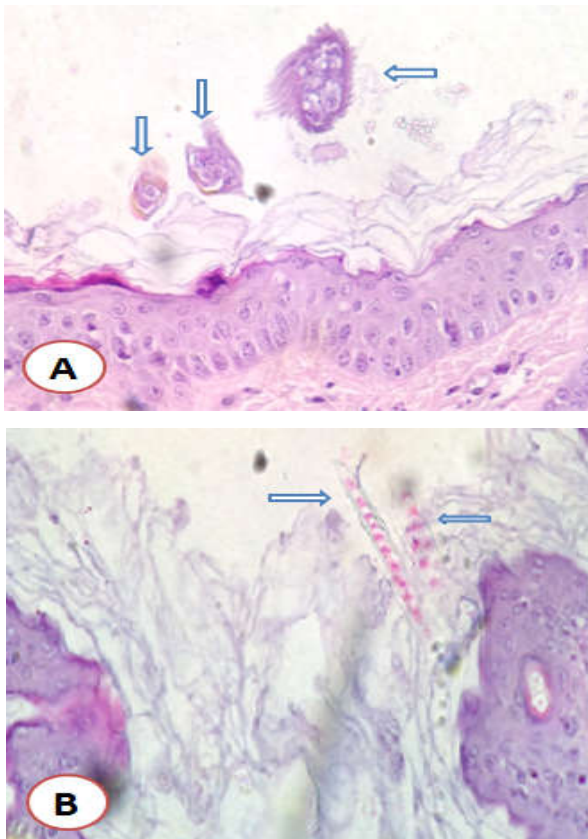


Figure 3 A. Epidermal layer of skin with hyperplasia of stratum corneum & stratum granulosum. Present of adult mites on superficial layer (arrow). B. Epidermis with introduced mouth part (hypostome and pedipalps).

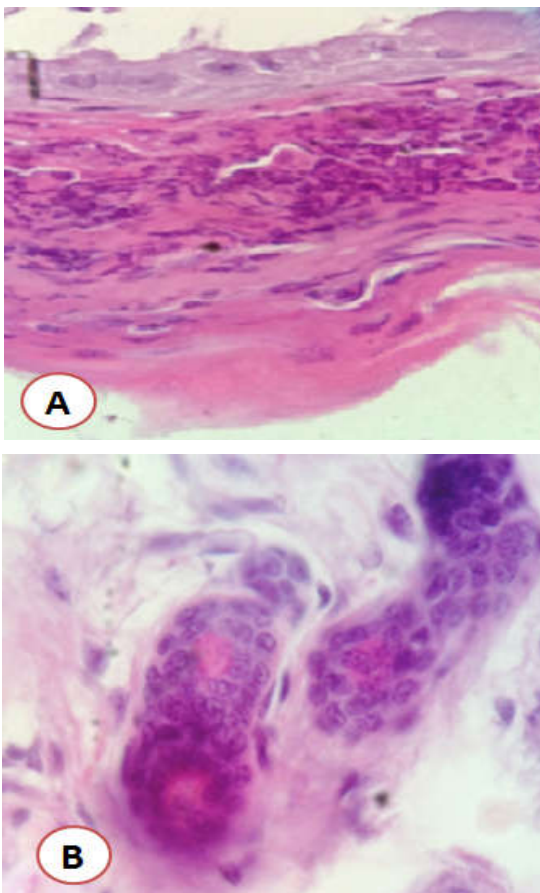


Figure 4 A. the deep dermal layer of skin with thickness and sever infiltration with leukocytes (monocytes and eosinophils). B. the deep dermal layer with alopecia and destruction of hairfollicles.

DISCUSSION

In this study the mite *O. bacoti* was discovered from colonies of naturally infected mice. No informations are available about the occurrence of this mite in any place of our country especially in Kurdistan region/north of Iraq. This may be the first report which deals with these arthropods. *O bacoti* were commonly known as the tropical rat mite. It is endemic in many parts of the United State. It was first described by Hirst in Australia in 1913(13) and is common in temperate climates of the world (14). It is about 80% of wild rodents in Germany are infested by this parasite (2).

This mite was diagnosed according to the morphological characteristics. All reports have been similar way used for identification of this mite (15, 16). Diagnosis is based on the identification of mite on the animal or in its environment (2, 19). Unfed mites were gray whites, while fed mites were red brown (5).

The source of infestation of mice colonies in our laboratory might be introduced this mite either by wild mice or rodent had been in freely found around the area of laboratory. (17, 18) reported that the *O. bacoti* has the widest host range parasitic a variety of hosts of domestic and wild mammals and and birds and its the host commonly reported mesostigmatid mite both in laboratory rodent and colonies. However, report of mesostigmatid mite infestation in laboratory rodent facilities have generally been uncommon in the last two decades. Recently, however several institutions reported onfestation with *O. bacoti* (tropical rate mite) and *Laelpse echidninus* (spiring rat mite) (14) and (4).

This mite *O. bacoti*was caused severe irritation signs and pruritic dermatitis skin lesion in infested mice in this present investigation. (2) And (19) found the two mites in laboratory rodent colonies, *O. bacoti* and *L. Rechidnin* also bite human and have potential to transmit zoonotic disease. Pet rodents can be infested from in apparent to pruritic with excoriation (2, 19).

Mite infestation cause several health problems in mice, including; ulcerative dermatitis, amyloidosis and other immune system alteration (20, 21) observed severe rate mite infestation cause debility, anemia in rodents. But (1) observed no clinical effects in lightly infested case, while, in this study severe suppurative pruriticdermatitis was observed with 7.4% of mortality due to *O. bacoti*infestation.

These parasites induce a non-specific dermatitis by their mouth parts and saliva components (22).

In this study the efficacy of Ivermectin against *O. bacoti* was observed. The one group which received a high dose 0.3 mcg/ kg of Ivermectin showed neurotoxic effect of the drug include; severe tremor and death of all mice (n=10) in a group, while the other group become safety and with good response to treatment without side effects and completely recovered of mice from mites. There were several literatures which dealt with control and remove of different type of mite from rodents by using different drugs. (23)Used Butox vet (Deltamethrin) 12.5% as dipped solution against *O. bacoti* in mice. The treated mice completely recovered for a single treatment and did not show side effects.

Various insecticides such as malathion (8), methylcarbonate (24), Lindane (9) and Vapona (21) have been successful in eradicating *O. bacoti* infestation in laboratory mice. One of its wide margins of safety, ease of administration and mechanism of action. Ivermectin is a popular anthelmintic for use in laboratory and domestic animals and humans. Gamma amino butyric acid (GABA) an important neurotransmitter in vertebrates as found principally in the central nervous system of mammals (25). The overdosing with Ivermectin as it can cause neurological problems and be very distressing. Symptoms of overdoses can be lack of coordination, tremor, blindness, disorientation or weakness (25). Although, the ivermectin is frequently used to eliminate mite infested, examples *Myocoptes musculus ulinus* and *Myobia musequili* (two of the most common mites) in rodents (26, 27, 28).

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